

III. Remarks

A. Amendments to the Claims

Applicants have amended claim 21 and canceled claims 29–37 without prejudice to file the canceled claims in a divisional application. Support for the amended claim is provided in the Specification at Paragraph [0047] of Example 1, in particular, by the phrase “The mixture was then dried in a vacuum. . . .”

B. Rejections of Claims under 35 U.S.C. Section 102

The Examiner has maintained the following three rejections under 35 U.S.C. Section 102(b).

- 1(a) **Claims 29–34 stand rejected under 35 U.S.C. § 102(b) as being anticipated by United States Patent No. 3,522,158 to Garnett et al. (“Garnett et al.”) for the reasons set forth on page 3 of the Office Action mailed February 23, 2005.**
- 1(b) **Claims 29, 35 and 36 stand rejected under 35 U.S.C. § 102(b) as being anticipated by United States Patent No. 3,461,052 to Restaino et al. (“Restaino et al.”) for the reasons disclosed on pages 3 and 4 of the Office Action mailed February 23, 2005.**
- 1(c) **Claims 29 and 37 stand rejected under 35 U.S.C. § 102(b) as being anticipated by United States Patent No. 4,831,097 to Chuang et al. (“Chuang et al.”) for the reasons disclosed on pages 3 and 4 of the Action mailed February 23, 2005.**

2. Applicants' Response

Applicants have canceled claims 29–37, which are the only claims identified in the rejections. As a result of the cancellation of claims 29–37, the rejections are moot and should be withdrawn.

C. Rejections of Claims under 35 U.S.C. Section 103

The Examiner has maintained the rejection of claims 21–28 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 3,461,052 to Restaino et al. in view of United States Patent No. 5,223,171 to Jost et al. for the reasons disclosed on pages 6 and 7 of the Office Action dated April 17, 2006, which are set forth below for convenient reference.

1. Examiner's reasons in support of the rejection

Applicants claim a method for grafting an unsaturated monomer onto a polysaccharide comprising the steps of: (1) forming a mixture comprised of an unsaturated monomer and a water soluble or water dispersible polysaccharide; (2) irradiating the mixture with an amount of electron beam radiation sufficient to form an unsaturated monomer-water soluble or water dispersible polysaccharide graft copolymer, wherein the graft copolymer is depolymerized to a molecular weight lower than the molecular weight of the ungrafted polysaccharide, and the polysaccharide in the copolymer has a weight of no more than 700,000 Daltons. Additional limitations in the dependent claims include specific unsaturated monomers and specific polysaccharides.

The Restaino et al. patent discloses a process for the production of graft substrates by ionizing radiation, wherein a hydrophilic polymeric substrate is irradiated in the presence of a solution of a monomeric vinyl compound (see abstract). See column 2, 1st paragraph wherein suitable substrates materials are listed, which include cellulose, wool, starch, alginic acid and the alginates, vegetable gums such, for example, as locust bean gum, guar flour or gum tragacanth, gelatin, casein, pectin, polyvinyl alcohol, hydrophile high molecular weight polyalkylene glycols, and the like, which meet the requirement of the polysaccharides disclosed in instant Claims 22–25. Suitable vinyl monomers are listed in the 2nd paragraph of column 2, which include vinyl acetate, acrylic acid and its esters, methacrylic acid and its esters, acrylamide, acrylonitrile, styrene, vinyl toluene, vinyl pyridine, alkyl vinyl pyridines, divinyl benzene, butadiene, N,N-methylene bis-acrylamide, and the like, which meet the requirements of the unsaturated monomers disclosed in instant Claims 22 and 26–28. The Restaino et al. patent also teaches using radiation to produce graft copolymers wherein the radiation may also be used to depolymerize the polymers. See column 3, 2nd paragraph wherein the Restaino et al. patent teaches that useful graft copolymers of cellulose degradation products may be obtained by employing higher radiation doses.

The method for grafting an unsaturated monomer onto a polysaccharide of the instant claims differs from the process of producing graft copolymers in the Restaino et al. patent by claiming that the polysaccharide in the copolymer has a molecular weight of no more than 700,000 Daltons.

However, the Jost et al. patent, which discloses detergent composition containing biodegradable graft polysaccharide shows that graft polysaccharide which consists essentially of a polydextrose having an average-weight molecular mass of less than 10,000 is well known in the art (see abstract). The average-weight molecular mass of less than 10,000 disclosed in the Jost et al. patent falls [within] the requirement of the instant claims that the polysaccharide in the copolymer has a molecular weight of no more than 700,000 Daltons. See column 2, lines 22-25, wherein the Jost et al. patent discloses graft polydextrose being obtained by any known process for grafting ethylenically unsaturated monomers onto polysaccharides and the next sentence which states that the grafting may be effected by irradiation, which is within the scope of the process requirements of instant Claims 21-28.

One having ordinary skill in the art would have been motivated to employ the process of the prior art with the expectation of obtaining the desired product because the skilled artisan would have expected the analogous starting materials to react similarly.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the polysaccharide of the graft copolymers produced in the process using radiation for depolymerization of polysaccharide of the Restaino et al. patent with polysaccharide having a molecular weight of not more than 700,000 Daltons in view of the recognition in the art, as evidenced by the Jost et al. patent, that polysaccharide having an average-weight molecular mass of less than 10,000 allows for the preparation of a product which is biodegradable.

(Examiner's Office Action, page 6, line 6 to page 7, line 30).

**2. Legal standard for determining whether
Applicants' claims are obvious under 35 U.S.C. Section 103**

The legal interpretation of Section 103 to be applied is set forth in the recent Supreme Court decision of *KSR International Co. v. Teleflex Inc. (KSR)*, 550 U.S. __, 82 USPQ2d 1385 (2007). *KSR* cites *Graham v. John Deere Co. of Kansas City* (383 U.S. 1, 17-18 [148 USPQ 459] (1966)) as setting out an objective analysis for applying Section 103. (82 USPQ2d at 1388). The objective analysis is as follows:

Under § 103, the scope and content of the prior art are to be determined, the differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy.

(148 USPQ at 467).

Accordingly, the factual inquiries set forth by the Court are as follows:

- [T]he scope and content of the prior art are . . . determined;
- Differences between the prior art and the claims at issue are . . . ascertained;
- The level of ordinary skill in the pertinent art [is] resolved; and
- Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized. . . .

3. Application of the *Graham v. John Deere Co.* factual standards

(a) Determining the scope and content of the prior art

Restaino et al. discloses:

A process for the radiation induced grafting of vinyl monomers to hydrophilic polymeric substrates, particularly polyvinyl alcohol. . . . The substrate moistened with water is contacted with a fluid vinyl monomer capable of free radical catalyzed polymerization and irradiated with high energy ionizing radiation to a dosage of 2000 to 10^8 roentgens.

(Abstract).

The Restaino et al. process “comprises contacting the vinyl monomer in fluid, preferably liquid, form with moist substrate irradiated with ionizing radiation. The irradiation of the moist substrate may be effected prior to its contact with the fluid monomer or while it is in contact therewith. (Column 2, lines 23–28).

In the Restaino et al. process, “The degree of moistening can vary over a wide range. As little as 10% by weight of water on the hydrophilic substrate markedly increases the rate of grafting.” (Column 2, lines 31–34). Restaino et al. further discloses:

A preferred procedure, then, is to moisten the hydrophilic substrate with from about 30% to about 100% of the amount of water it will imbibe without formation of a supernatant phase, immerse the moistened substance in the chosen vinyl monomer or monomers, or in a solution thereof in an inert solvent, subject the suspension to gamma-ray irradiation, remove it from the radiation field and separate the formed graft copolymer from an reacted and homopolymerized monomer.

(Column 2, lines 54–62).

In Example 1, Restaino et al. describes the irradiation of moist filter paper which had been immersed in water until fully soaked, then treated with a solution of monomeric acrylic acid in benzene and irradiated. The treated paper was determined to be a graft copolymer of acrylic acid on cellulose and gained 23.6% in weight over the original filter paper. (Column 3, lines 36–58).

Example 1 also discloses the same procedure was followed using dry filter paper in place of moist filter paper.

Dry filter paper immersed in acrylic acid solution of the same concentration and subjected to the same degassing, irradiation dose and separation procedure as the foregoing showed no gain in weight at all.

(Column 3, lines 63–66).

In all of the Examples according to the invention, the material to be irradiated is moist and the product weighed more than the treated material, *i.e.*, the product was a graft copolymer. The comparative Examples in which the material to be irradiated is dry prior to irradiation resulted in no weight gain, or virtually no weight gain. (See column 3, lines 62–66, column 4, lines 22–25, column 5, lines 44–48, and column 6, lines 20–22 and 71–72.) Accordingly, the Restaino et al. process requires that the grafting of vinyl monomers to hydrophilic polymeric substrates by irradiation requires that the hydrophilic polymeric substrates are moist during irradiation. If the hydrophilic polymeric substrates are dry prior to irradiation, the irradiation step produces no cross-linking.

In support of the rejection, the Examiner relies on Restaino et al. as disclosing “a process for the production of graft substrates by ionizing radiation, wherein a hydrophilic polymeric substrate is irradiated in the presence of a solution of a monomeric vinyl compound.” The Restaino et al. patent is also relied on as teaching “using radiation to produce graft copolymers wherein the radiation may also be used to depolymerize the polymers.” (Examiner’s Action dated April 17, 2006, at page 6, lines 17–19 and page 6, line 29, to page 7, line 2).

Turning to Jost et al., the Examiner states:

However, the Jost et al. patent, which discloses detergent composition containing biodegradable graft polysaccharide shows that graft polysaccharide which consists essentially of a polydextrose having an average-weight molecular mass of less than 10,000 is well known in the art (see abstract). The average-weight molecular mass of less than 10,000 disclosed in the Jost et al. patent falls within the requirement of the instant claims that the polysaccharide in the copolymer has a molecular weight of no more than 700,000 Daltons.

(Examiner's Action dated April 17, 2006, at page 7, lines 8-15).

Jost et al. is directed to:

A detergent composition containing, as a "builder," a graft polysaccharide which consists essentially of a polydextrose having an average-weight molecular mass of less than 10,000 and onto which a water-soluble ethylenically unsaturated monomer is grafted.

(Abstract).

Jost et al. discloses that grafting may be effected by irradiation. The grafted product appears to be a combination of the polydextrose and ethylenically unsaturated monomer. Accordingly, the product has a higher molecular weight than the monomers forming the product. (Column 2, lines 22-25).

**(b) Ascertaining the differences
between the prior art and the claims at issue**

As described in the Abstract, Restaino et al. discloses a process for the radiation induced grafting of vinyl monomers to hydrophilic polymeric substrates. Restaino et al. discloses that the hydrophilic starting polymer should be moistened with water before irradiation. (Column 2, lines 13-62). This disclosure is followed in all of the Examples according to the invention.

Restaino et al. further discloses repeatedly that “dry” hydrophilic starting polymers treated in the same manner as the moist starting polymers had no gain in weight, or virtually no gain in weight, indicating that no grafting occurred. (See column 3, lines 63–66, column 4, lines 22–25, column 5, lines 44–48 and column 6, lines 20–22 and lines 71–72).

Applicants’ process as claimed in claims 21–28 comprises the step of drying the mixture of unsaturated monomer and polysaccharide before irradiation. Accordingly, Applicants’ claimed process has a drying step which is the opposite of the moistening step in the process described in Restaino et al. Indeed, Restaino et al. discloses that drying the material before irradiation is to be avoided because irradiated material does not undergo grafting.

Jost et al. discloses grafting a polysaccharide onto a water-soluble ethylenically unsaturated monomer. Nowhere is there disclosed in Jost et al. that the graft polymer is formed by grafting an unsaturated monomer containing functional groups onto a polysaccharide by electron beam radiation and then by depolymerizing the starting material comprised of unsaturated monomer and polysaccharide. Jost et al. also does not disclose that the starting material also undergoes the step of drying the mixture prior to the irradiation step.

Accordingly, Jost et al. cannot be combined with Restaino et al. to obtain Applicants’ claimed method.

(c) Resolving level of ordinary skill in the pertinent art

The inventors of the present application and the inventors of the prior art patents would represent persons of ordinary skill in the art.

**4. Applicants' claimed method is nonobvious
over the Restaino et al. and Jost et al. patents**

For the reasons set forth above, Restaino et al. teaches away from Applicants' claimed method step (2) of drying the mixture. Jost et al. does not disclose, or in any manner suggest to one of ordinary skill in the art, Applicants' step (2). Jost et al. also does not disclose Applicants' method step (3) of irradiating the mixture with electron beam irradiation sufficient to form an unsaturated monomer-water soluble or water dispersible polysaccharide graft copolymer, wherein the graft copolymer is depolymerized to a molecular weight lower than the molecular weight of the ungrafted polysaccharide, and the polysaccharide in the copolymer has a molecular weight of no more than 700,000 Daltons.

Accordingly, for the reasons set forth above, the rejection of claims 21-28 under 35 U.S.C. Section 103(a) as being unpatentable over United States Patent No. 3,461,052 to Restaino et al., in view of United States Patent No. 5,223,171 to Jost et al., is untenable and should be withdrawn.

IV. Conclusion

Applicants believe that the foregoing Amendments and Remarks constitute a complete response under 37 C.F.R. Section 1.111 and that all bases of rejection in the Examiner's Action have been adequately rebutted or overcome. A Notice of Allowance in the next Office is, therefore, respectfully requested. The Examiner is requested to telephone the undersigned attorney if any matter that can be expected to be resolved in a telephone interview is believed to impede the allowance of pending claims 21-28 of United States Patent Application No. 10/607,079.

Respectfully submitted,

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